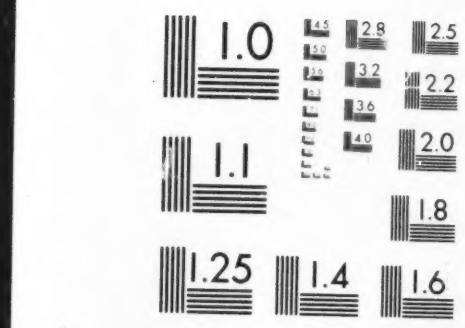

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ABSTRACT

The determination of final success of educational research and development projects is an important problem for those concerned with project management and evaluation. The purpose of this study was twofold: (a) to determine if schedule, cost, quality/performance, follow-on work, spin-off benefits, and customer/client satisfaction were given a different order of importance by different persons associated with education projects and what the order of importance was; and (b) to determine if a composite/criterion of educational project success employing the same criteria could be established. The data were obtained through mailings to project managers, parent organization representatives, and government project monitors of 218 terminated projects funded by the U.S. Office of Education. Sixty-five percent responded to the mailing by completing the data collection instruments. It was found that different persons associated with educational projects viewed the importance of the criteria of project success in much the same way, in the following order of importance: (a) quality/performance; (b) customer/client satisfaction; (c) spin-off benefits; (d) follow-on work; (e) cost; and (f) schedule. (A section citing implications for project management and evaluation, suggestions for future research, and an appendix of data collection tools is included.) (JS)

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THE FEASIBILITY OF DETERMINING SUCCESS CRITERIA FOR EDUCATIONAL RESEARCH AND DEVELOPMENT PROJECTS

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Rodney J. Ball
Research for Better Schools, Inc.

and

Desmond L. Cook
The Ohio State University

March, 1975

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I. Introduction

The determination of the final success of educational research and development projects is an important problem for those concerned with project management and evaluation. One immediate problem encountered in determining project success is defining what is meant by "success." By what criteria is success measured? Does a successful project mean only that performance objectives have been achieved and/or that schedules and budgets were met? Are these three or other criteria more important? This paper highlights some of the major results of a study concerned with this problem.

A. Criteria of Project Success

Local school districts, state departments of education, and the U. S. Office of Education have employed a wide variety of criteria in evaluating educational projects. Examples of these criteria are:

1. improved reading scores
2. increased inter-ethnic group contact and understanding
3. Improved physical, social, and emotional development of disadvantaged pupils
4. increased parent involvement

Research studies concerned with project success in education have resulted in the identification of many criteria.[1] Examples of these are:

1. constructive change
2. meeting objectives
3. innovative and creative
4. serving a sizeable number
5. meeting area needs
6. development of skills
7. acceptance by others
8. acceptable level of output
9. employment criteria met
10. within budget

Although numerous criteria for determining project success have been identified many are vaguely defined if defined at all. Others are closely tied to funding agency requirements regarding how the project is to be conducted. Many of these, such as "serving a sizeable number" and "employment criteria met" really don't appear to be measures of project success. Rather, they appear to be indicators of whether or not the funds were spent according to funding agency regulations. Are all of these criteria of equal importance?

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[1] Of particular importance in this respect is the work: H. Del Schalock, et al, The Oregon Studies in Educational Research, Development, Diffusion, and Evaluation--Volume I, Summary Report (Monmouth, Oregon: Teaching Research, Division of the Oregon State System of Higher Education, 1972).

B. Success as a Dependent Variable

Once it is known what constitutes success, research can be directed toward discovering those variables in the management of projects critical to determining a successful project. The determination of what constitutes a successful project is also a necessary initial step in the evaluation of projects. If success is to serve as a dependent variable in project management research and evaluation, then a valid and reliable measure of it is necessary.

One of the objectives in a study reported by Marquis and Straight[2] in 1965 was to determine what was considered success in the performance of research and development projects. The laboratory manager, project manager, government technical monitor, and government contract administrator associated with each of thirty-seven projects were asked to identify their criteria of project success and to rank them in order of importance. Technical performance was ranked first by the majority of respondents followed by meeting schedule, meeting target cost, customer satisfaction, profit, follow-on business, company prestige, develop technical capability, and commercial applications. Marquis and Straight chose to use cost overrun, schedule overrun, and technical performance as indicators of project success in exploring relationships between project organizational variables and project success.

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[2] Donald G. Marquis and David M. Straight, Jr., "Orgainzational Factors in Project Performance," Research Program Effectiveness--Proceedings of the Conference Sponsored by the Office of Naval Research (Washington, 1965).

In 1973, Baker[3] and others reported the results of a study designed to specify the relationships among situational, organizational, and project management process variables as they relate to project success. Data were gathered by questionnaire from 646 persons involved in project management withing business, industry, and government. The factor analysis of the questionnaire responses resulted in the identification of a factor that was subsequently used as a measure of project success. The factor was comprised of questionnaire items relating to client, parent organization, project team, and user satisfaction with the outcome of the project; the technical adequacy of the project end result; and a statement that all things considered, the project was a success.

The studies of Marquis and Baker illustrate the importance of specifying project success in the conduct of project management research and evaluation. Research studies such as these have identified other numerous criteria subsequently employed in the measurement or determination of project success.

C. Framework for the Study of Project Management

In 1970, Cook conducted a research study resulting in a conceptual framework (illustrated in Figure 1) to be used for the study of project management.[4] The purpose of the effort was to integrate the results of

---

[3] Bruce N. Baker, Dalmar Fisher, and David C. Murphy, "Factors Affecting Success of Project Management," Proceedings of the Fifth Annual Seminar - Symposium of the Project Management Institute, (Toronto, Canada, 1973).

[4] Desmond L. Cook, "A Conceptual Framework for the Study of Project Management," Proceedings of the Third Annual Seminar-Symposium of the Project Management Institute (Houston, Texas, 1971).

past and current studies and to direct further research on project management. Project success represents a major component of the conceptualization. It includes the potential criteria defined below.

1. Schedule refers to meeting project milestone deadlines and the scheduled project termination date as established in the project contract. Success on this dimension means that the project was completed on or before the scheduled termination date and that all subsections or components of the project were completed as scheduled.

2. Cost refers to meeting the total dollar expenditure predicted for the entire life of the project. Success on this dimension means that the actual dollar cost of the project was less than or coincided with the predicted cost.

3. Quality/Performance refers to the achievement of the goals and objectives of the project. Success on this dimension means that the performance standards specified by the project objectives were met or exceeded.

4. Customer/Client Satisfaction refers to the degree to which the funding agency or user of the end product of the project is satisifed. This criterion is not necessarily concerned with the quality of the project as indicated by whether or not the original objectives and performance standards were met. It is concerned only with the satisfaction of the funding agency or customer.

5. Spin-off refers to indirect benefits received by the parent institution, its faculty, and the project staff. Success on this dimension means, for example, that the project and/or the parent institution's faculty

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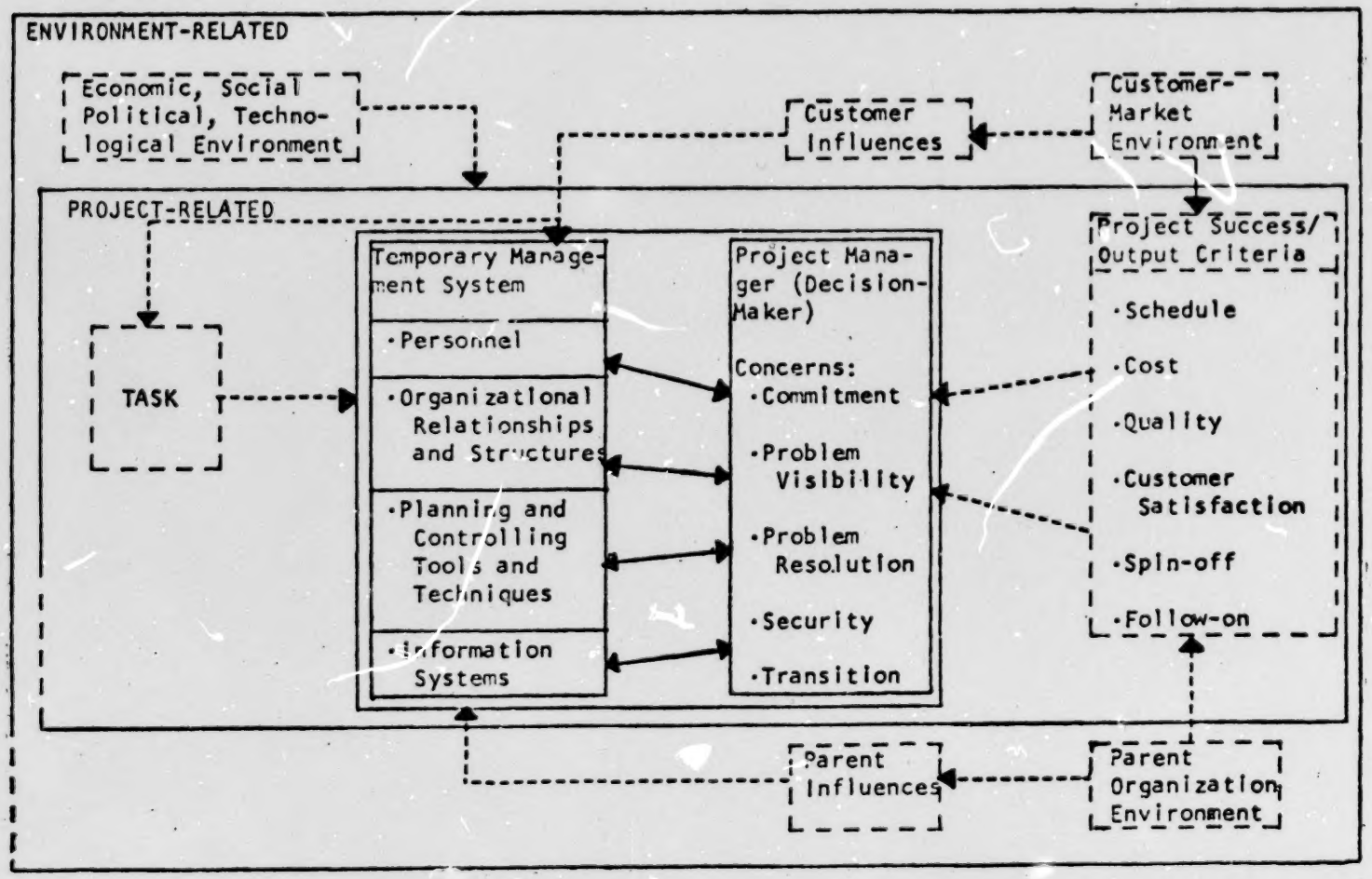

Fig. 1. Conceptual framework for project management

developed skills as a result of working with the project which can be applied to other areas of the institution's operations. Another important spin-off benefit is the recognition an institution often gains from a highly successful project.

6. Follow-on Work refers to additional contracts or follow-on work obtained as a result of the success of the original project and consequent enhancement of the reputation of the researcher. This criterion is not, however, concerned with additional work obtained as a logical or technical extension of the original project.

In addition to identifying potential criteria for assessing project success, Cook's conceptual framework suggests that different persons may have different viewpoints on project success, and that these would be reflected in their ranking of the potential success criteria. For example, project managers may be most concerned with time, cost, and performance, whereas, parent organization representatives (administrators, deans, department chairman) may be quite concerned about spin-off benefits, follow-on work, and customer or funding agency satisfaction.

II. Purpose

The purpose of this study was to explore two basic hypotheses or assumptions suggested by Cook's conceptual framework in regard to the criteria of project success. The major objectives of the study were:

1. To determine if schedule, cost, quality/performance, follow-on work, spin-off, and customer/client satisfaction are given

a different order of importance by different persons associated with educational projects and what the order(s) of importance is (are).

2. To determine if a composite criterion of educational project success employing the criteria of schedule, cost, quality/performance, follow-on work, spin-off, and customer/client satisfaction could be established.

III. Procedures

A sample of educational projects was first selected and then the personnel associated with the conduct and monitoring of the projects were identified as the source of data for the study. The instruments used in the collection of data, the sample and data collection procedures, and the data analysis procedures are briefly described below.

A. Instruments

A Criteria Ranking Form using a paired-comparison format was developed to obtain rankings of the relative importance of the potential criteria of project success. A Project Rating Form using a seven-point, equal-interval scale was developed to obtain ratings of actual projects on the potential criteria and overall success. Copies of these instruments appear in the Appendix.

Some of the hypotheses of the study (not reported here) required that information be collected regarding the parent organization housing the pro-

ject, the previous experience of the project principal investigator, the supervision given the project by others, and the familiarity of the respondent with the project being rated.

B. Sample and Data Collection

The data for the study were obtained from the project manager, parent organization representative, and government project monitor associated with each project in a sample of 218 terminated projects funded in one of the several regions under the Regional Research Program of the National Center for Educational Research and Development, United States Office of Education. The projects were all operated and terminated during the period from September, 1967 to January, 1972; had a maximum government support of $10,000, and were usually conducted or managed by a single "principal investigator."

The data were collected in 1972 by means of six initial mailings and a follow-up mailing to all non-respondents for whom correct mailing addresses could be assumed. Sixty-five percent of the project principal investigators and parent organization representatives responded to the mailing by completing the data collection instruments. Ninety-five percent of the Criteria Ranking Forms received were usable, and 93 percent of the Project Rating Forms were usable. The one government monitor associated with the entire sample of projects responded by completing the Criteria Ranking Form and numerous Project Rating Forms.

C. Data Analysis

In order to obtain a ranking of the six criteria of project success, the paired-comparison data were run on the PCMP computer program of the Psychology Department of The Ohio State University. This program follows the assumptions of the Thurstone Case III model and computes a scale value for each criterion.

In order to measure the agreement within groups of respondents, a coefficient of agreement, u, was computed.[5] The chi-square test of significance of u gives one a level of confidence in stating that the agreement of a group in ranking something is not the result of chance, but does, in fact, indicate some agreement among the members of the group.

In order to measure the agreement between different groups of respondents in their rankings of the relative importance of the criteria, an analysis of variance procedure was used in estimating the reliability of scale values given the criteria by the groups.[6] This represents the degree of agreement of the groups or judges in the scale values they have given the criteria.

In order to obtain a composite criterion of project success, the ratings of projects on the six criteria plus overall success made by the re-

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[5]Maurice G. Kendall, Rank Correlation Methods (London: Charles Griffin and Company Limited, 1948), page 126.

[6]Robert L. Ebel, "Estimation of the Reliability of Ratings," Psychometrika, 16, 4 (December, 1951): pages 407-424.

spondents were run on the Wherry Test Selection Program of the Psychology Department of The Ohio State University. The program is a regression analysis program which selects, in order of decreasing importance, the variables contributing significant variance to the prediction of the criterion variable (overall success).

IV. Results

It was found that different groups of persons associated with educational projects viewed the relative importance of the six possible criteria of project success much the same. There may be some differences between individuals, but as a group project principal investigators and parent organization representatives view the criteria in the following order of importance.

1. Quality/Performance
2. Customer/Client Satisfaction
3. Spin-off Benefits
4. Follow-on Work
5. Cost
6. Schedule

The scale values for the ranking of the criteria by the two groups are given in Table 1. The coefficient of agreement, u, within the groups was 0.373 for the 136 principal investigators and 0.415 for the 72 parent organization representatives. The significance of the chi-square value (.001 level) in both cases indicated a level of agreement (1.00 is complete agreement) among the group members not attributable to random choices.

The agreement in rankings between the groups of project principal investigators and parent organization representatives is illustrated in Figure 2. A coefficient of agreement or reliability of 0.96 was obtained between the two groups.

The composite criterion of overall project success generated for project principal investigators and parent organization representatives is summarized in Tables 2 and 3. Note that the shrunken multiple R changed very little after two or three variables were included in the prediction equation. These variables were quality/performance, customer/client satisfaction, and spin-off benefits. The maximum shrunken multiple R obtained in each case was a little over 0.700 which indicates that the three criteria are accounting for approximately 50 percent of the variance in the criterion variable of overall project success.

TABLE 1

SCALE VALUES FOR RANKING OF PROJECT SUCCESS CRITERIA MADE BY PRINCIPAL INVESTIGATORS AND PARENT ORGANIZATION REPRESENTATIVES ASSOCIATED WITH A SAMPLE OF EDUCATIONAL PROJECTS

Groups / Criteria	Principal Investigator (N=136)	Parent Organization Representative (N=72)
Quality	2.97	2.81
Customer Satisfaction	1.87	1.61
Spin-off	1.61	0.99
Follow-on Work	1.25	0.89
Cost	0.00	0.32
Schedule	0.03	0.00

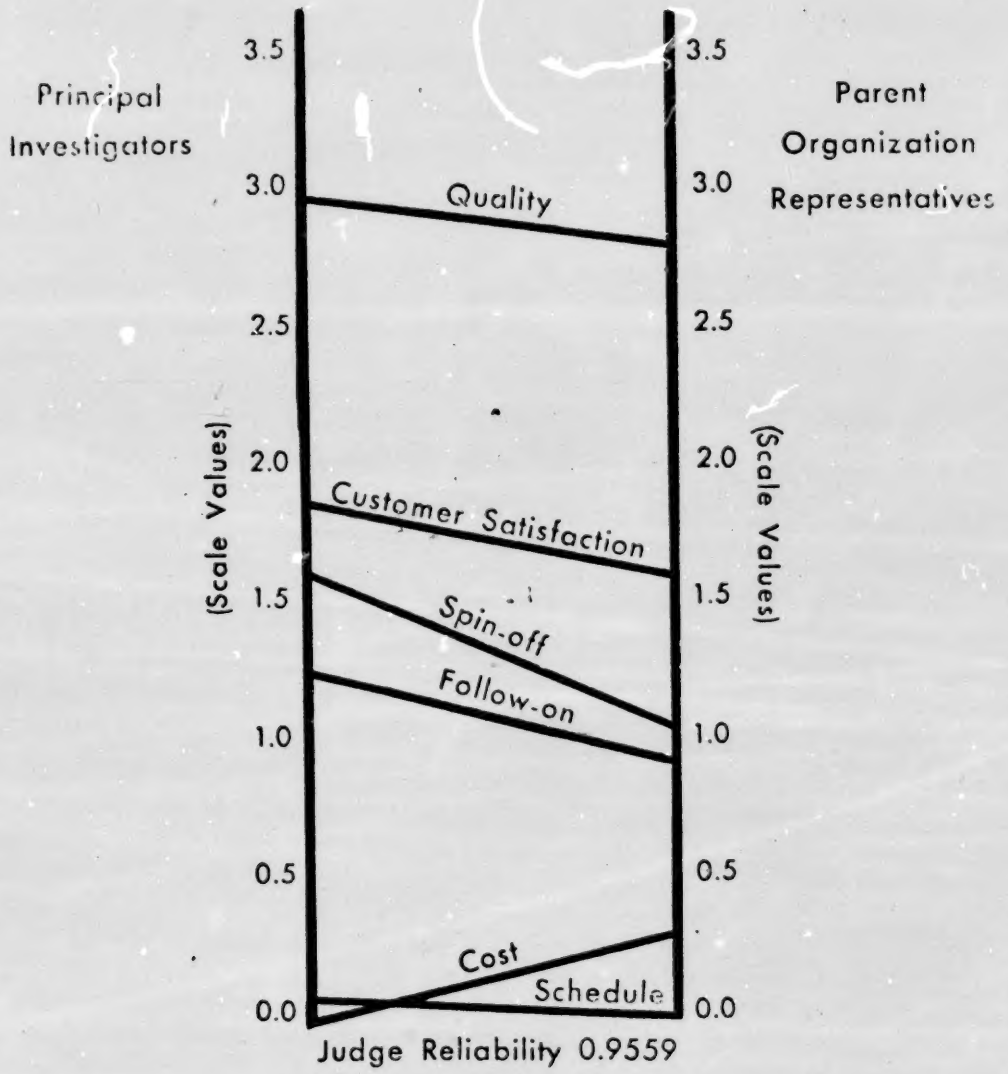

Figure 2. Comparison of scale values given to criteria of project success by principal investigators and parent organization representatives

TABLE 2

SUMMARY OF REGRESSION ANALYSIS FOR PROJECT PRINCIPAL INVESTIGATORS

Variable Symbol	Variable Name	Correlation With Overall Success	F For Increase	Multiple R	Shrunken R
X_0	Overall Success	--	--	--	--
X_1	Quality	0.589	69.53	0.589	0.585
X_2	Customer/Client Satisfaction	0.575	38.41	0.704	0.699
X_3	Spin-off	0.347	7.47	0.723	0.716
X_4	Cost	0.010	4.16	0.734	0.724
X_5	Schedule	0.152	1.22	0.737	0.724

TABLE 3

SUMMARY OF REGRESSION ANALYSIS FOR PARENT ORGANIZATION REPRESENTATIVES

Variable Symbol	Variable Name	Correlation With Overall Success	F For Increase	Multiple R	Shrunken R
X_0	Overall Success	--	--	--	--
X_1	Quality	0.660	53.99	0.660	0.654
X_2	Spin-off	0.475	10.66	0.715	0.705
X_3	Customer/Client Satisfaction	0.573	5.93	0.742	0.728

V. Implications for Project Management and Evaluation

The most important criterion in determining the success of a project appears to focus upon quality/performance. This finding is supported by the Baker[7] study. To have a successful project, the project manager should concentrate on the achievement of the goal and objectives of the project. Management decisions are said to usually involve trade-offs between time, cost, and performance. Since time or schedule and cost were ranked the lowest among the six criteria of project success considered, the project manager should try to maximize quality/performance when faced with decisions involving trade-offs between time, cost, and performance.

The parallel implication for project monitors, contract administrators, and evaluators is not to attach high importance to meeting project schedule and cost constraints. Although completing a project on schedule and within budget may appear to be important, achieving the goal and objectives of a project is far more important. Consequently, time and cost factors should not be unnecessarily constrained to the detriment of project performance.

Although much writing in project management literature stresses the importance of time, cost, and performance factors to the project manager, there are other very important factors that deserve consideration. Among these are customer/client satisfaction, spin-off benefits, and follow-on

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[7] Bruce N. Baker, Dalmar Fisher, and David C. Murphy, "Factors Affecting Success of Project Management," page 4.

work. These factors may appear to be external to the project and of secondary importance, but the findings indicate that they are of substantial importance in judging the success of a project. The project manager, needs to concern himself with the likely effects of his decisions upon the satisfaction of the funding agency and ultimate client or user with the end product of the project. He should also be concerned with the indirect benefits the project may have for the parent organization, its staff, and the project staff. Finally, he should be concerned with the implications that project success has on obtaining other additional or follow-on projects for himself and/or his parent organization following the termination of the project.

The parallel implication for project monitors and evaluators is to give consideration to these factors when determining the success of a project.

In summary, the major implication or recommendation for the educational project manager is to achieve the project goal and objectives even if one has to overrun the schedule and budget. Relative to other criteria, time and cost are not very important. And, while one is striving to achieve the objectives of the project, try to ensure that the customer or user will, in the end, be satisfied. Also try to maximize spin-off benefits such as the development of skills in the project staff and new capabilities in the parent organization. Finally, don't overlook the importance of trying to obtain future projects for the parent organization.

VI. Suggestions for Further Research

Based upon the limitations and findings and conclusions of this study, the following recommendations for future research related to determining the success of educational projects are made.

1. Quality/performance is considered to be by far the most important criterion of educational project success. Measurement on the criterion is most often achieved by obtaining the opinion or judgment of knowledgeable individuals. Consequently, the reliability and validity of the evaluation of projects on this criterion is often open to question. Research directed toward improving the reliability and validity of measurement on this important criterion is needed.

2. This study dealt with projects of a limited size or scale from a limit geographic region that were nearly all conducted in a college or university setting. Research is needed to determine if the results hold for larger, more complex projects conducted in different educational institutions across the country. For example, future studies might include large, state or federally funded projects in large, city public school districts in their sample.

3. The variability of the projects included in the study on the criterion of cost was limited by the fact that the contracts were all of the fixed price type. It is quite possible that the importance of the criterion of cost may vary with the type of contract issued. Future studies should include projects operated under a variety of contract types.

4. Studies directed at discovering which variables in the management of educational projects are critical in determining a successful project, should use a composite criterion as the dependent variable which includes the factors of quality/performance, spin-off benefits, and customer/client satisfaction.

APPENDIX

Success Criteria Ranking

Listed below in pairs are the criteria of educational project success that were defined on the previous page. Select the criterion in each pair that you feel is the more important of the two in judging the success of a project by placing an "x" before the more important criterion in each pair. After you have finished, turn the page and continue. Be sure that all items are marked.

1. ___customer/client satisfaction
   ___cost

2. ___quality/performance
   ___schedule

3. ___cost
   ___spin-off

4. ___schedule
   ___follow-on work

5. ___spin-off
   ___quality/performance

6. ___customer/client satisfaction
   ___schedule

7. ___follow-on work
   ___quality/performance

8. ___schedule
   ___cost

9. ___quality/performance
   ___customer/client satisfaction

10. ___spin-off
    ___follow-on work

11. ___cost
    ___quality/performance

12. ___customer/client satisfaction
    ___follow-on work

13. ___schedule
    ___spin-off

14. ___follow-on work
    ___cost

15. ___spin-off
    ___customer/client satisfaction

Check the box at the right if you would like to receive a copy of the results of this study of educational project success criteria. ☐

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Project Success Rating Scale

PROJECT NUMBER_____ PROJECT PRINCIPAL INVESTIGATOR_____

PROJECT TITLE_____

_____

The several criteria of project success defined before appear below in a rating scale format. Rate the project identified above on each of these criteria. Cross out the number on each scale that best approximates your rating of the project on that criterion. At the bottom of the page indicate your familiarity with the project.

Schedule..... 1 — 2 — 3 — 4 — 5 — 6 — 7
far behind schedule — on schedule — far ahead of schedule

Cost..... 7 — 6 — 5 — 4 — 3 — 2 — 1
far under — on predicted cost — far over

Quality/Performance..... 1 — 2 — 3 — 4 — 5 — 6 — 7
standards far from met — standards met — standards greatly exceeded

Customer/Client Satisfaction..... 7 — 6 — 5 — 4 — 3 — 2 — 1
extremely satisfied — quite satisfied — somewhat satisfied — unsatisfied

Spin-off..... 1 — 2 — 3 — 4 — 5 — 6 — 7
no spin-off — some spin-off — moderate spin-off — substantial spin-off

Follow-on Work..... 7 — 6 — 5 — 4 — 3 — 2 — 1
substantial follow-on — moderate follow-on — some follow-on — no follow-on

Overall Success..... 1 — 2 — 3 — 4 — 5 — 6 — 7
unsuccessful — somewhat successful — quite successful — extremely successful

Your familiarity with project..... 7 — 6 — 5 — 4 — 3 — 2 — 1
extremely familiar — quite familiar — somewhat familiar — unfamiliar